



## MODELLO SCHEDA INSEGNAMENTO

Corso di L/LM/LMCU	Corso di Studio di Laurea Magistrale in SCIENZE E TECNOLOGIE GENETICHE
Denominazione insegnamento:	Scienze e Tecnologie Omiche - Proteomica e Metabolomica (Modulo di Proteomica)
Numero di Crediti:	6 CFU
Semestre:	Primo Semestre
Docente Titolare:	Rosa Anna Siciliano
Dottorandi/assegnisti di ricerca che svolgono attività didattica a supporto del corso:	
Orario di ricevimento:	Martedì 9.30-11.00 previo appuntamento (e-mail rsiciliano@isa.cnr.it)
Indirizzo:	Istituto di Scienze dell'Alimentazione del CNR Via Roma 64, 83100 Avellino

### PRESENTAZIONE DEL CORSO:

The Proteomics Module is aimed at training students on the most up to date proteomic strategies that can help to understand the functional role of proteins in their specific biological environment.

Nowadays, proteomics is successfully applied to study complex biological systems in a global and dynamic perspective. This discipline is now a powerful tool in life science

### GLI OBIETTIVI FORMATIVI

During this course, students will acquire knowledges on the main analytical techniques (electrophoresis, chromatography and mass spectrometry) and proteomics. Students will apply this expertise in the structural study of proteins and in the design of the most suitable strategies for specific proteomic studies.

### PREREQUISITI RICHIESTI

Basic knowledge in organic chemistry, biochemistry and protein chemistry.

## **FREQUENZA DELLE LEZIONI**

It strongly recommended. Training and practical exercises on mass spectra interpretation and protein identification will be performed.

## **CONTENUTI DEL CORSO**

### **INTRODUCTION TO PROTEOMICS**

From proteins to proteomics

### **ELECTROPHORETIC TECHNIQUES IN PROTEOMICS**

Protocols for sample preparation. Mono and two-dimensional electrophoresis. Image analysis of 2-DE maps. Differential gel electrophoresis (DIGE)

### **MASS SPECTROMETRY**

Introduction to mass spectrometry. Ion sources used for protein and peptide analyses: MALDI and ESI ion sources. Mass analyzers: Quadrupole, TOF, Ion Trap mass analyzers, Orbitrap. The hybrid instruments. Tandem mass spectrometry: interpretation of fragmentation spectra. Mass spectrometry for the structural characterization of proteins: analysis of intact proteins; mass mapping approaches for the control of the primary structure of proteins; assignment of protein post-translational modifications.

### **CHROMATOGRAPHIC TECHNIQUES IN PROTEOMICS**

Liquid chromatography: ion exchange chromatography, gel permeation chromatography, affinity chromatography, reversed phase chromatography. Two-dimensional chromatography and LC-MS instruments

### **PROTEIN IDENTIFICATION**

Analytical strategies for protein identification: peptide mass fingerprinting (PMF), Sequence Query and MS/MS Ion Search approaches

### **QUANTITATIVE PROTEOMICS AND FUNCTIONAL PROTEOMICS**

Analytical approaches in differential and quantitative proteomics: label-based (ICAT, SILAC, iTRAQ, <sup>18</sup>O) and label-free (spectral counts) proteomic approaches. Targeted and un-targeted proteomics. Functional proteomics

## **METODI DIDATTICI**

The Course includes lectures on the main analytical techniques (electrophoresis, chromatography and mass spectrometry), strategies and bioinformatics tools applied in proteomics. In addition, practical exercises will allow the students to get expertise on MALDI and ESI mass spectra interpretation and analytical strategies for protein identification. Finally, the students will carry out a proteomic experiment, thus applying some of the procedures learned during the course.

## **TESTI DI RIFERIMENTO**

Introduction to Proteomics, Daniel C. Liebler, ed. Humana press

Scientific papers and other teaching material will be provided to the students

## **ESAME DI PROFITTO**

The evaluation method, based on the oral exam that integrates Proteomics and Metabolomics Modules, is aimed at evaluate the knowledge and understanding acquired by the student on both proteomics and metabolomics.

## CALENDARIO ESAMI

Rinvio al link

## PRENOTAZIONE ESAMI

Rinvio al link

## SYLLABUS

Argomenti	Ore	Riferimenti bibliografici	Tipologia di lezione
Introduction to proteomics	4	Introduction to Proteomics, DC. Liebler, ed. Humana press	Lessons
Electrophoretic techniques in proteomics	6	Scientific papers teaching material provided to the students	Lessons
Mass spectrometry	16	Scientific papers teaching material provided to the students	Lessons Practical exercises
Chromatographic techniques in proteomics	2	Teaching material provided to the students	Lessons
Protein identification	16	Introduction to Proteomics, DC. Liebler, ed. Humana press Scientific papers teaching material provided to the students	Lessons Practical exercises
Quantitative proteomics and functional proteomics	4	Scientific papers teaching material provided to the students	Lessons
Proteomic analysis of bacterial cells. Identification of proteins	12		Laboratory exercise